MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
Bldg. 202 Rm. 211
Gaithersburg, Maryland 20899

SRM Number: 3121
MSDS Number: 3121
SRM Name: Gold Standard Solution
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SECTION I. MATERIAL IDENTIFICATION

Material Name: Gold Standard Solution

Description: SRM 3121 is a single element solution prepared gravimetrically to contain a nominal 10 mg/g of gold with a hydrochloric acid volume fraction of 10 %.

Other Designations: Gold (gold leaf) in **Hydrochloric Acid** (aqueous hydrochloric acid; hydrogen chloride; muriatic acid); **Gold Chloride*** (auric chloride; gold trichloride; auric trichloride; gold (III) chloride) in **Standard Solution**

Name	Chemical Formulas	CAS Registration Numbers
Hydrochloric Acid	HCl	7647-01-0
Gold Chloride	$AuCl_3$	13453-07-1
Gold	Au	7440-57-5

DOT Classification: Hydrochloric Acid, Solution ID#: UN1789

Manufacturer/Supplier: Available from a number of suppliers.

* The addition of gold to hydrochloric acid, along with other intermediate chemical reactions, forms gold chloride which will precipitate upon evaporation or drying of the sample.

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Hydrochloric Acid	10	ACGIH TLV-TWA: 5 mg/kg or 7.6 mg/m^3
		OSHA Standard Air (CL): 5 mg/kg or 7.6 mg/m^3
		Human, Inhalation: LC_{LO}: 1 300 mg/kg/30 min
		Human, Inhalation: LC_{LO}: 3 000 mg/kg/5 min
		Rat, Inhalation: TC_{LO}: 685 Φg/m^3/24 hrs
Gold Chloride	1.5	No TLV-TWA established.
		Rat, Subcutaneous: TD_{LO}: 22 106 Φg/kg
Gold	1	No TLV-TWA established.
		Rat, Intravenous: LD_{LO}: 58 mg/kg

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Hydrochloric Acid	Gold Chloride	Gold
Appearance and Odor: A colorless liquid; pungent, irritating odor.	**Appearance and Odor:** Yellow to red hygroscopic crystals.	**Appearance and Odor:** A lustrous, yellow solid.
Relative Molecular Mass: 36.46	**Relative Molecular Mass:** 303.32	**Relative Atomic Mass:** 196.97
Density: 1.05 (10 % hydrochloric acid)	**Density:** 3.9	**Density:** 19.31
Solubility in Water: Soluble	**Solubility in Water:** Soluble	**Solubility in Water:** Insoluble
Solvent Solubility: Soluble in alcohol and benzene.	**Solvent Solubility:** Soluble in alcohol and ether; slightly soluble in ammonia.	**Solvent Solubility:** Soluble in aqua regia, hot sulfuric acid, and alkali cyanide solutions.

NOTE: The physical and chemical data provided are for the pure components. Physical and chemical data for this gold/hydrochloric acid solution do not exist. The actual behavior of the solution may differ from the individual components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A **Method Used:** N/A **Autoignition Temperature:** N/A

Flammability Limits in Air (Volume %): **UPPER:** N/A
LOWER: N/A

Unusual Fire and Explosion Hazards: Hydrochloric acid is a negligible fire hazard when exposed to heat and/or flames. Hydrochloric acid may react with the evolution of heat on contact with water; the acid may release toxic, corrosive, flammable, or explosive gases.

Extinguishing Media: Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen.

Special Fire Procedures: Firefighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

SECTION V. REACTIVITY DATA

Stability: **__X__ Stable** **_____ Unstable**

Conditions to Avoid: Avoid heat, moisture, and combustible materials.

Incompatibility (Materials to Avoid): Hydrochloric acid is incompatible with cyanides, metals, amines, bases, metal cyanides, oxidizing materials, acids, halo carbons, combustible materials, halogens, and metal salts.

See Section IV: *Unusual Fire and Explosion Hazards*.

Hazardous Decomposition or Byproducts: Thermal decomposition of hydrochloric acid may release acid halides. Thermal decomposition of gold chloride may release acid halides and chlorine.

Hazardous Polymerization: **_____ Will Occur** **__X__ Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: __X__ **Inhalation** __X__ **Skin** __X__ **Ingestion**

Health Hazards (Acute and Chronic): Hydrochloric Acid: Hydrochloric acid may be fatal if inhaled, swallowed, or absorbed through the skin. This material causes burns and is extremely destructive to the tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation, and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Hydrochloric acid also causes severe burns.

Gold and Gold Chloride: Gold and gold chloride may be harmful by inhalation, ingestion, or skin absorption. Exposure may cause irritation or allergic reactions. Gold chloride is a strong sensitizer to humans.

Medical Conditions Generally Aggravated by Exposure: Preexisting skin conditions may be aggravated by the acids.

Listed as a Carcinogen/Potential Carcinogen:

		Yes	**No**
In the National Toxicology Program (NTP) Report on Carcinogens	___	X	
In the International Agency for Research on Cancer (IARC) Monograph	___	X	
By the Occupational Safety and Health Administration (OSHA)		___	X

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 min. Obtain medical assistance if necessary.

Inhalation: If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

Ingestion: If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance immediately.

TARGET ORGAN(S) OF ATTACK: **Hydrochloric Acid:** lungs, upper respiratory tract (URT), skin, and teeth.
Gold Chloride: immune system (sensitizer)

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

Waste Disposal: Follow all federal, state, and local laws governing disposal.

Handling and Storage: Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for nonroutine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store this material at room temperature.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Hydrochloric Acid*, June 2, 1999.
MDL Information Systems, Inc., MSDS *Gold*, June 2, 1999.
MDL Information Systems, Inc., MSDS *Gold Chloride*, September 10, 1998.
Handbook of Chemistry and Physics, 70th ed., 1989 – 1990.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given on the NIST Certificate of Analysis.